



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
|-----------------|-------------|----------------------|---------------------|------------------|

10/636,046

08/07/2003

Takamasa Tanikuni

N23773402E

9958

7590

09/01/2004

Darryl G. Walker  
WALKER & SAKO, LLP  
Suite 235  
300 South First Street  
San Jose, CA 95113

EXAMINER

PAREKH, NITIN

ART UNIT

PAPER NUMBER

2811

DATE MAILED: 09/01/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                               |                                    |  |
|------------------------------|-------------------------------|------------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>10/636,046 | Applicant(s)<br>TANIKUNI, TAKAMASA |  |
|                              | Examiner<br>Nitin Parekh      | Art Unit<br>2811                   |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 19 July 2004.
- 2a) ☐ This action is FINAL.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 4-6 and 8-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 and 7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>4</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Information Disclosure Statement***

1. The Information Disclosure Statement filed on 08-07-03 has been considered.

### ***Election/Restriction***

2. Applicant's election without traverse of Group I, claims 1-3 and 7 in Paper No. 3 is acknowledged.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1 and 2 are rejected under 35 U.S.C. 102(e) as being anticipated by Li et al. (US Pat. 6753260).

Regarding claims 1 and 2, Li et al. disclose semiconductor device (Fig. 5) comprising:

- a wiring structure in which an upper surface of a metal line/wiring made of a copper (14 in Fig. 5; Col. 2, line 46) containing film is covered with an insulation film (24 in Fig. 5), and

- a composite etch stop/barrier film (see 16/18 in Fig. 1, also referenced as 20 in Fig. 2-5) being formed covering the upper surface of the wiring, the composite etch stop/barrier film comprising an etch stop/barrier film such as silicon carbide/SiC (Col. 2, line 55) and an etch stop/cap film (16 and 18 respectively in Fig. 1-5; Col. 2, line 54) where the etch stop/barrier film is between the wiring and the etch stop/cap film for preventing copper diffusion, and
- the etch stop/barrier film further preventing the metal line/wiring from being exposed to any constituents used to form the etch stop/cap film (Col. 1, lines 24-54; Col. 4, lines 55-61) and thus being functional as an exposure prevention film for the underlying metal line/wiring

(Fig. 5; Fig. 1-5; Col. 2, line 25- Col. 4, line 68).

### ***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (US Pat. 6753260).

Regarding claim 2, preventing the wiring exposure from the gas used in forming the cap film do not distinguish over Li et al., because only the final product/structure is relevant, not the process of forming the cap film such as using "gas" or "plasma species" or "liquid". Note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hirao, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Fessmann, 180 USPQ 324; In re Avery, 186 USPQ 161; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); and In re Marrosi et al., 218 USPQ 289, all of which make it clear that it is the patentability of the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that applicant has the burden of proof in such cases, as the above case law makes clear. See also MPEP 706.03(e).

7. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (US Pat. 6753260) in view of McDevitt et al. (US Pat. 6518643).

Regarding claim 3, Li et al. teach substantially the entire claimed structure as applied to claim 1 above, except the cap film including a SiCN film.

McDevitt et al. teach a wiring structure having a stacked/composite etch stop/barrier layer (see 130 and 132/134 in Fig. 3) comprising an etch stop/cap layer including a SiCN (see 130 in Fig. 3; Col. 5, line 49) on an etch stop/barrier layer including SiC and silicon oxide (132/134 in Fig. 3) to provide desired etch-resistance and diffusion barrier for the wiring structure (Col. 5, line 35- Col. 6, line 37).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the cap film including the SiCN film as taught by McDevitt et al. so that the diffusion barrier and etch selectivity can be improved and the desired dielectric constant for the composite dielectric layer can be achieved in Li et al's wiring structure.

8. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al. (US Pat. 6753260) in view of admitted prior art (APA).

Regarding claim 7, Li et al. teach substantially the entire claimed structure as applied to claim 1 above, except the wiring structure including a multilayer wiring (MLW) structure including a plurality of wiring layers separated by respective interlayer insulation film (IIF).

The APA teaches using a conventional MLW structure comprising a plurality of wiring layers separated by respective interlayer insulation film/IIF (see specification page 2, Japanese Pat. 2002-83870: Fig. 1-6).

It would have been obvious to a person of ordinary skill in the art at the time invention was made to incorporate the MLW structure including a plurality of wiring layers separated by respective IIF as taught by the APA so that multilevel connection can be achieved and the interconnect density can be improved in Li et al's wiring structure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nitin Parekh whose telephone number is 571-272-1663. The examiner can normally be reached on 09:00AM-05:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.

Art Unit: 2811

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.



Nitin Parekh

PATENT EXAMINER

TECHNOLOGY CENTER 2800

NP

08-27-04